

BUREAU OF WATER

South Carolina Department of Health and Environmental Control

SHELLFISH MANAGEMENT AREA 01

2003 ANNUAL UPDATE

Shellfish Sanitation Program

Water Monitoring, Assessment and Protection Division
Environmental Quality Control - Bureau of Water
2600 Bull Street
Columbia, South Carolina 29201

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2003 ANNUAL UPDATE

[Data Through December 2002]

Shellfish Management Area 01

Shellfish Sanitation Program



Preparer: Fred K. Earnhardt, District Shellfish Program Manager
Waccamaw Environmental Quality Control District
1705 Oak Street Plaza
Myrtle Beach, South Carolina 29577

Reviewers/Editors:
David G. Baize, Division Director
(and) Charles Newell, Shellfish Program Manager
Water Monitoring, Assessment, and Protection Division
Environmental Quality Control - Bureau of Water
2600 Bull Street
Columbia, South Carolina 29201

David G. Baize, Division Director
Water Monitoring, Assessment, and Protection Division
Environmental Quality Control - Bureau of Water

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ANNUAL UPDATE
Shellfish Management Area 01
SCDHEC EQC Bureau of Water

Data Inclusive Dates:

01 / 01 / 00 thru 12 / 31 / 02

Classification Change:

 Yes X No

Shoreline Survey Completed: Yes

(I)ncreased/(D)ecreased/(N)one:

 N Approved

 N Cond. Approved

 N Restricted

 N Prohibited

Prior Report & Date: 2002 Annual Update

SUMMARY

Activities contributing to water quality degradation continue to occur due to the rapid development of lands within the Shellfish Area 01 Management Area. Due to continued development and associated boating activities, the Atlantic Intracoastal Waterway (AIWW) portion of Area 01 should retain it's prohibited classification. Due to the present unpredictable nature of Hog Inlet pollution events, Approved or Conditionally Approved classifications cannot be recommended. NPS and watershed program efforts should be directed towards quantification of nonpoint sources impacting the Hog Inlet estuary.

INTRODUCTION

PURPOSE AND SCOPE

The authority to regulate the harvest, sanitation, processing and handling of shellfish is granted to the South Carolina Department of Health and Environmental Control by Section 44-1-140 of the Code of Laws of South Carolina, 1976, as amended. The Department promulgated Regulation 61-47 which provides the rules used to implement this authority and outlines the requirements applied in regulating shellfish sanitation in the State. This regulation specifically addresses classification of shellfish harvesting areas and requires that all areas be examined by sanitary and bacteriological surveys and classified into an appropriate shellfish harvesting classification.

The National Shellfish Sanitation Program (NSSP) Guide For The Control Of Molluscan Shellfish is used by the United States Food and Drug Administration (USFDA) to evaluate state shellfish sanitation programs. The NSSP Model Ordinance requires that a sanitary survey be in place for each growing area prior to its use as a source of shellfish for human consumption and prior to the area's classification as Approved, Conditionally Approved,

Restricted, or Conditionally Restricted. Each sanitary survey shall be updated on an annual basis and accurately reflect changes which have occurred within the area. Requirement of the annual reevaluation include, at a minimum, field observations of pollution sources, an analysis of water quality data consisting of the past year's data in combination with appropriate previously collected data, review of reports and effluent samples from pollution sources, and review of performance standards for discharges impacting the growing area. A brief report documenting the findings shall also be provided.

The following criteria consistent with the NSSP Model Ordinance and S.C. Regulation 61-47 are used in establishing shellfish harvesting classifications:

Approved - Growing areas shall be classified Approved when the sanitary survey concludes that fecal material, pathogenic microorganisms, and poisonous or deleterious substances are not present in concentrations which would render shellfish unsafe for human consumption. The Approved area classification shall be designated based upon a sanitary survey which includes water samples collected from stations in the designated area adjacent to actual or potential sources of pollution. For waters sampled under adverse pollution conditions, the median fecal coliform Most Probable Number (MPN) or the geometric mean MPN shall not exceed fourteen per one hundred milliliters, and not more than ten percent of the samples shall exceed a fecal coliform MPN of forty-three per one hundred milliliters (per five tube decimal dilution). For waters sampled under a systematic random sampling plan, the geometric mean fecal coliform Most Probable Number (MPN) shall not exceed fourteen per one hundred milliliters, and the estimated ninetieth percentile shall not exceed an MPN of forty three (per five tube decimal dilution). Computation of the estimated ninetieth percentile shall be obtained using NSSP Guidelines.

Conditionally Approved - Growing areas may be classified Conditionally Approved when they are subject to temporary conditions of actual or potential pollution. When such events are predictable, as in the malfunction of wastewater treatment facilities, non-point source pollution from rainfall runoff, discharge of a major river, or potential discharges from dock or harbor facilities that may affect water quality, a management plan describing conditions under which harvesting will be allowed shall be adopted by the Department prior to classifying an area as Conditionally Approved. Where appropriate, the management plan for each Conditionally Approved area shall include performance standards for sources of controllable pollution, e.g., wastewater treatment and collection systems, evaluation of each source of pollution, and means of rapidly closing and subsequent reopening areas to shellfish harvesting. Memorandums of agreements shall be a part of these management plans where appropriate.

Restricted - Growing areas shall be classified Restricted when sanitary survey data show a limited degree of pollution or the presence of deleterious or poisonous substances to a degree which may cause the water quality to fluctuate unpredictably or at such a frequency that a Conditionally Approved classification is not feasible. Shellfish may be harvested from areas classified as Restricted only for the purposes of relaying or depuration and only by special

permit issued by the Department and under Department supervision. For Restricted areas to be utilized as a source of shellstock for depuration, or as source water for depuration, the fecal coliform geometric mean MPN of restricted waters sampled under adverse pollution conditions shall not exceed eighty-eight per one hundred milliliters and not more than ten percent of the samples shall exceed a MPN of two hundred and sixty per one hundred milliliters for a five tube decimal dilution test. For waters sampled under a systematic random sampling plan, the fecal coliform geometric mean MPN shall not exceed eighty-eight per one hundred milliliters and the estimated ninetieth percentile shall not exceed an MPN of two hundred and sixty (five tube decimal dilution). Computation of the estimated ninetieth percentile shall be obtained using NSSP guidelines.

Conditionally Restricted - Growing areas may be classified Conditionally Restricted when they are subject to temporary conditions of actual or potential pollution. When such events are predictable, as in the malfunction of wastewater treatment facilities, non-point source pollution from rainfall runoff, discharge of a major river, or potential discharges from dock or harbor facilities that may affect water quality, a management plan describing conditions under which harvesting will be allowed shall be prepared by the Department prior to classifying an area as Conditionally Restricted. Where appropriate, the management plan for each Conditionally Restricted area shall include performance standards for sources of controllable pollution (e.g., wastewater treatment and collection systems and an evaluation of each source of pollution) and description of the means of rapidly closing and subsequent reopening areas to shellfish harvesting. Memorandums of agreements shall be a part of these management plans where appropriate. Shellfish may be harvested from areas classified as Conditionally Restricted only for the purposes of relaying or depuration and only by permit issued by the Department and under Department supervision. For Conditionally Restricted areas to be utilized as a source of shellstock for depuration, the fecal coliform geometric mean MPN of Conditionally Restricted waters sampled under adverse pollution conditions shall not exceed eighty-eight per one hundred milliliters and not more than ten percent of the samples shall exceed a MPN of two hundred and sixty per one hundred milliliters for a five tube decimal dilution test. For waters sampled under a systematic random sampling plan, the fecal coliform geometric mean MPN shall not exceed eighty-eight per one hundred milliliters and the estimated ninetieth percentile shall not exceed an MPN of two hundred and sixty (five tube decimal dilution). Computation of the estimated ninetieth percentile shall be obtained using NSSP guidelines.

Prohibited - Growing areas are classified Prohibited if there is no current sanitary survey or if the sanitary survey or monitoring data show unsafe levels of fecal material, pathogenic microorganisms, or poisonous or deleterious substances in the growing area or indicate that such substances could potentially reach quantities which could render shellfish unfit or unsafe for human consumption.

BACKGROUND INFORMATION

Area 01 consists of approximately 3289.13 acres of shellfish growing area habitat located in Horry County, South Carolina. It is comprised of estuarine portions of Little River, Little River Inlet, Dunn Sound, Hog Inlet, Milliken Cove, and the Atlantic Intracoastal Waterway (AIWW). The area is bounded to the east by the North Carolina-South Carolina state line, on the west by Sea Mountain Highway and portions of the AIWW southwest of the U. S. Highway 17 bridge traversing the AIWW, and on the south by Cherry Grove Beach, Waites Island, and the Atlantic Ocean. Approximately seven nautical miles of AIWW shoreline define the northern boundary (Figure 1).

The harvesting classifications of Area 01 prior to this sanitary survey were as follows:

- Prohibited - AIWW from Highway 9 to the North Carolina border & Little River Estuary from Tilghman's Point to the AIWW (1146.04 acres)
- Restricted - Little River Estuary seaward of Tilghman's Point, including all portions of Dunn Sound & Hog Inlet (2143.09 acres)

The shellfish industry in South Carolina is based on primarily on the harvest of the eastern oyster (*Crassostrea virginica*) and hard clams, which include both the northern clam (*Mercenaria mercenaria*) and several small populations of the southern clam (*Mercenaria campechiensis*). The South Carolina Department of Health and Environmental Control currently disallows harvesting of oysters and clams within Area 01 for direct marketing purposes; however, Hog Inlet, Dunn Sound, and Little River Inlet are suitable as a source of shellfish for indirect marketing through the use of depuration (controlled purification) and/or relaying (transplanting) activities. Two commercial clam relay projects have been permitted during the past three-year review period.

Shellfish harvesting season in South Carolina normally extends from September 16 through May 14. The South Carolina Department of Natural Resources (SCDNR) has the authority to alter the shellfish-harvesting season for resource management purposes and grant permits for year-round mariculture operations. Additionally, the South Carolina Department of Health and Environmental Control has the authority to prohibit shellfish harvesting when necessary to ensure that shellfish harvested in South Carolina waters are safe for human consumption.

POLLUTION SOURCE SURVEY

SURVEY PROCEDURES

Shoreline surveys of Area 01 were conducted by the Waccamaw District Shellfish

Sanitation staff, by watercraft, vehicle and on foot, during the survey period and are ongoing. Extensive visual examination of lands adjacent to the waters of Area 01 was conducted to determine potential sources of pollution entering shellfish growing waters.

POINT SOURCE POLLUTION

- A. Municipal and Community Waste Treatment Facilities** - The City of North Myrtle Beach operates two wastewater facilities with permitted discharges to the AIWW at separate locations in the southern reaches of Area 01. These facilities are typically operated efficiently and within National Pollution Discharge Elimination System (NPDES) permit limitations. Although they contribute to pollution loading within the AIWW, their discharges to the AIWW are six miles from the closest viable shellfish (subtidal clams) populations and therefore have no adverse impact upon the area's shellfish beds. Additionally, Grand Strand Water and Sewer Authority's Vereen Wastewater Treatment Plant discharges to a series of Carolina Bays (naturally occurring, densely foliated, elliptically shaped depressions subject to fluctuating water levels) to the northwest of the AIWW. Ultimately these bays drain to the AIWW due to fluctuating water levels. Figure 2 indicates WWTP discharge locations within Area 01. Appendix A contains NPDES permit information.
- B. Industrial Waste** - Industrial discharges have not been permitted within Area 01.
- C. Marinas** - Numerous marinas and multiple docking facilities, providing anchorage for commercial and recreational water craft, are located along the AIWW portion of Area 01. Locations of these facilities are indicated in Figure 3. Table 1 summarizes services provided by these facilities.
- D. Radionuclides** - Sources of radionuclides have not been identified within Area 01, and radionuclide monitoring has not been conducted. No poisonous or deleterious substances have been documented. No poisonous or deleterious substances have been identified within the area.

NONPOINT SOURCE POLLUTION

- A. Urban and Suburban Stormwater Runoff** - Nonpoint source runoff is a substantial problem in Area 01 due to increasing development. This development is not confined to lands immediately adjacent to shellfish growing areas but also includes lands adjacent to the AIWW south of Area 01, as well portions of North Carolina adjacent to Calabash Creek and surrounding areas. An existing network of dead-end finger canals in the Cherry Grove section of Area 01 is the recipient of the majority of drainage from streets and paved surface areas. Finger canals typically exhibit poor flushing action. This has contributed to sediment accretion within the canals. Additionally, tidal flooding in portions of Cherry Grove is a common occurrence due to spring tides and storm

systems. Permitted storm water sites for land disturbance activities are indicated on the map of potential pollution sources.

The lands surrounding shellfish growing waters in Area 01 consist of various soil types and conditions. These have been defined by the United States Department of Agriculture, Soil Conservation Service (1986) utilizing general classifications and descriptions. Although lands within Area 01 consist of numerous soil types, the area is generally comprised of Lakeland-Leon-Newhan soils, nearly level and gently sloping soils that have a sandy or loamy subsoil. The United States Department of Agriculture (1986) further describes these soils as "excessively drained and poorly drained soils that are sandy throughout: in drainage ways, on broad ridges and slopes, and on dunes."

There are no approved solid waste landfills located within close proximity to Area 01 shellfish growing waters, however several unpermitted trash dumps have been found in the Little River Neck area adjacent to the AIWW.

- B. Agricultural Runoff** - There are no major commercial farming activities occurring on a large scale adjacent to Area 01 waters. Fertilizer, pesticide, and herbicide usage is limited primarily to residential lawn maintenance and golf courses. Several golf courses are located throughout the area and contribute to nonpoint source pollution loading.
- C. Individual Sewage Treatment and Disposal (ISTD) Systems** - Interviews with SCDHEC Bureau of Environmental Health personnel indicate that large portions of the Little River Neck and residences bordering the AIWW are serviced by ISDT systems. Soils are suitable for installation and efficient operation of ISDT systems; however, they are being phased out in lieu of municipal wastewater collection and treatment facilities. Central treatment systems have less potential for discharge of untreated wastewater although lift station malfunctions occasionally result in spills of untreated wastewater to the environment. Few system malfunctions have been noted within the past several years. North Myrtle Beach provides central collection service within East Cherry Grove.

Several municipal sewage collection system construction projects are currently underway in portions of Cherry Grove located to northwest of the Hog Inlet estuary, northeast of Sea Mountain Highway.

- D. Wildlife and Domestic Animals** - Area 01 supports substantial populations of both wildlife and domestic animals. The Tilghman Estate, consisting of approximately 1800 acres of wooded highlands at the northeastern section of Little River Neck and 500 acres of barrier island environment located on Waites Island, contains wildlife populations typical of the South Carolina coastal plain. The estate supports populations of rabbit, whitetail deer, raccoon, opossum, rodents, songbirds, and migratory waterfowl. Similar populations are located along the banks of the AIWW.

Due to the resort nature of the area, domestic animal populations are limited primarily to dogs and cats.

- E. Boat Traffic** - Little River Inlet provides ocean access for many recreational and commercial vessels. Additionally, the AIWW comprises a substantial portion of the waters of Area 01. Traffic is heavy except during winter months and is comprised of commercial barges and tugs, shrimpers, charter and head boats, and recreational sail and power boats of various sizes. Due to shallow depths, boat traffic within the Hog Inlet estuary is generally limited to small, shallow draft fishing craft of less than 5 meters in length. Extensive shoaling at the mouth of Hog Inlet greatly hinders navigation.
- F. Hydrographic and Habitat Modification** - Hydrologic and habitat modification in estuarine areas require both State and federal approval. Marina construction and maintenance dredging have been allowed at several locations within Area 01. Sand from the Hog Inlet shoals has been used for beach renourishment along Cherry Grove Beach. Little River Inlet and portions of the AIWW require maintenance dredging. The United States Army Corps of Engineers has designated tracts of land adjacent to the AIWW as dredge spoil sites. Additionally, a large portion of Cherry Grove Beach and Hog Inlet has been altered during the past few decades. Cherry Grove Inlet, originally located south of Hog Inlet, was filled during the 1950's. Numerous dead-end canals were constructed in order to maximize land development. Estuarine wetlands were filled and upland areas created. These activities have altered flow patterns throughout Hog Inlet.
- G. Marine Biotoxins** - During the winter and spring of 1988, South Carolina experienced an occurrence of "Red Tide", specifically *Ptychodiscus brevis* (*G. breve*), which affected water quality in Area 01. There has been no documented reoccurrences of this organism at levels requiring emergency response in South Carolina waters subsequent to the 1988 event. The Department participates in a State Task Group on Toxic Algae and operates a toxic algae emergency response team.

HYDROGRAPHICAL AND METEOROLOGICAL CHARACTERISTICS

PHYSIOGRAPHY

Area 01 may be described as a meso-tidal, bar-built estuary typical of South Carolina's northern coast. The entire system is approximately five nautical miles in length (northeast to southwest) and approximately two nautical miles in width (northwest to southeast). Characteristic of this type of system are ebb and flood tidal deltas and protective point bars which may not be readily apparent at Little River Inlet due to construction of a rubble jetty system. Main channel depths in Little River Inlet are maintained at 10 feet below mean low water (MLW). Main channel depths in the AIWW are maintained at 12 feet below MLW.

Depths in the creeks of Dunn Sound and Hog Inlet are not controlled. Sand and mud bars, as well as oyster reefs, are evident during low tides throughout the Little River Inlet-Dunn Sound-Hog Inlet portions of Area 01. Extensive shoaling is evident at the entrance to Hog Inlet.

Tides - Tides in Area 01 are semidiurnal, consisting of two low and two high tides occurring each lunar day. Mean tidal ranges during normal tides in Little River estuary vary from 4.0 feet at Nixon's Crossroads to 4.85 feet at the west end of Dunn Sound. Spring tides range from 4.56 feet to 5.58 feet. Mean tidal range in the Hog Inlet estuary is 4.71 feet. Spring tide is 5.46 feet. (Nautical Software Inc.) Wind direction and intensity, as well as atmospheric pressure, typically cause variations in predicted tidal ranges.

Rainfall - Historically, obtaining accurate rainfall data within Area 01 has not been possible. Subsequent to the spring of 1997, a precipitation data logger has been operated in the Cherry Grove Beach area. Although several minor malfunctions have occurred, the data logger generally provides effective real time precipitation data measurement. The system must be visited twice per week in order to assure proper operation.

Winds - Prevailing winds along the northern portion of the South Carolina coast are south during spring and summer and from the north during autumn and winter. Wind speeds are generally less than 15 miles per hour (mph); however, strong weather systems may generate winds in excess of 25 mph. Tropical storms and hurricanes occur occasionally.

River Discharges - Portions of Area 01 receive appreciable freshwater inflow from the Waccamaw River via the AIWW (Johnson, 1977). While net flow within the Waccamaw River-AIWW-Little River system is generally northward, tidal forces, flow within the Waccamaw and Pee Dee Rivers and other hydrographic influences cause variations in flow and salinity within the entire system (Turner, 1989). Additional freshwater input occurs via localized precipitation and resulting runoff. Little River originates in, and receives drainage from, Little River Swamp located on the west side of the AIWW. Calabash Creek receives drainage from portions of Brunswick County, North Carolina.

WATER QUALITY STUDIES

DESCRIPTION OF THE PROGRAM

The Department currently utilizes a systematic random sampling (SRS) strategy within Area 01 in lieu of sampling under adverse pollution conditions. In order to comply with NSSP guidelines, a minimum of thirty samples are required to be collected and analyzed from each station during the review period. Sampling dates are computer generated prior to the beginning of each quarterly period thereby insuring random selection with respect to tidal stage and weather. Day of week selection criteria is limited to Mondays, Tuesdays, and Wednesdays due to shipping requirements and laboratory manpower constraints. Sample schedules are rarely altered.

Beginning in July 1998, samples utilized for classification purposes have been limited to those samples collected in accordance with the SRS. Area classification is based upon samples collected during a 36-month period beginning January 1 (month one) and ending December 31 (month 36). This allows for a maximum of 36 samples per station yet provides a six-sample “cushion” (above the NSSP required 30 minimum) for broken samples, lab error, breakdowns, etc. This also allows each annual report to meet the NSSP Triennial Review sampling criteria.

Four hundred and thirty-two SRS surface water quality samples (<1.0 ft. deep) were collected for bacteriological analyses and classification purposes from 12 active water quality sampling stations (Table 2) in Area 01 during the period 01/01/00 through 12/31/02. The samples were collected in 120 ml amber glass bottles, immediately placed on ice and transported by bus to the South Carolina Department of Health and Environmental Control's Trident District Environmental Quality Control laboratory at North Charleston, South Carolina. An additional 120 ml water sample was included with each shipment as a temperature control. Upon receipt at the laboratory, sample sets that exceeded a 30-hour holding time or contained a temperature control >10 degrees C. were discarded. Samples collected after September 1, 1986 have been analyzed using the five tube/three dilution modified A-1 method described by Nuefeld (1985).

Surface water temperatures were measured utilizing hand-held, laboratory-quality calibrated centigrade thermometers. Salinity measurements were measured in the laboratory using automatic temperature compensated refractometers. Additional field data include ambient air temperature, wind direction, tidal stage and date and time of sampling. Tidal stages were determined Nautical Software's Tides and Currents, Version 2.2.

MONITORING RESULTS

All shellfish water quality fecal coliform mpn/100 ml geometric means exceeded a value of 14 with the exception of Stations 01, 05, 07, 17A, 18 and 19. All stations, with the exception of Station 01, exceeded a fecal coliform mpn/100 ml estimated ninetieth percentile value of 43.

During 2002 several special source identification samples were taken in area one. These samples used the multiple antibiotic resistance testing and coliphage identification testing methods to identify the source of the fecal coliform contamination. Additionally, fecal samples (animal) were collected in the study area to use for source correlation and identification. The results of the sampling did not yield any data that pointed to a specific fecal source. These sampling processes are new and need additional development. Hopefully in the future they will be of greater use in pollution source identification and make elimination of those sources easier.

A special summary of fecal coliform data vs. rainfall at stations within Hog Inlet estuary is also included at the bottom of the rain data sheets. This information indicates the variability of

water quality during both dry and wet weather.

CONCLUSIONS

Data review indicates a variety of factors exerting influences both singularly and in combination to define the water quality and subsequent shellfish harvesting classification of Area 01.

While three wastewater treatment point source discharges are located within close proximity to the southern reaches of Area 01, the primary source of elevated fecal coliform bacteria concentrations appears to be of a nonpoint source origin. Stormwater runoff from adjacent developed and undeveloped land areas, as well as freshwater input via the Waccamaw River are the major determining influences in Little River Inlet, the AIWW, and Dunn Sound. Freshwater input also occurs from Calabash Creek via drainage from Brunswick County, North Carolina.

Water quality sampling geometric mean values within Hog Inlet are less than those found in other portions of the area; however, the criteria for Approved shellfish harvesting waters are exceeded at nearly all locations. 2001 and 2002 saw a reduction in overall rainfall and associated runoff. Even with this reduction, only one site in Cherry Grove met the criteria for Approved status. This location was at the mouth of Cherry Grove Inlet and was under the direct influence of the Atlantic Ocean. Its close proximity to the Ocean and the reduction in runoff made this site unique in Area one. All other locations in Cherry Grove continue to have bacteria concentrations that necessitate a Restricted classification.

Substantial alterations to the physical characteristics of the Inlet over past decades has severely limited flushing. Although salinity values are generally higher in Hog Inlet, some mixing of waters occurs between Hog Inlet and Dunn Sound due to specific hydrographic and meteorological conditions. During high flow conditions in the AIWW, brackish water exiting Little River Inlet may move southeastward and enter Hog Inlet. This results in elevated fecal coliform levels within the estuary. However, bacteriological water quality sample values may, unpredictably, be less than 14/100 ml. Based on review of fecal coliform bacteriological data summaries and the pollution source survey, it is determined that Area 01 is impacted by five sources of actual or potential pollution:

1. **Freshwater Inflow** - Portions of Area 01 receive appreciable freshwater inflow from the Waccamaw River via the AIWW. Additionally, freshwater input occurs via localized precipitation and resulting runoff. Attempts at determining correlations between specific precipitation amounts and coliform mpn's have been inconclusive. Little River originates in, and receives drainage from, Little River Swamp located on the west side of the AIWW. Calabash Creek receives drainage from portions of Brunswick County, North Carolina.
2. **Nonpoint Source Runoff** - Stormwater runoff is a substantial problem in Area 01 due

to dense development. This development is not confined to lands immediately adjacent to shellfish growing areas but also includes lands adjacent to the AIWW north and south of Area 01.

3. Wastewater Treatment Plant Discharges - There are no municipal or community wastewater treatment facilities which discharge directly to the waters of Area 01 seaward of the SCDNR saltwater-freshwater dividing line; however, the City of North Myrtle Beach operates two wastewater facilities with permitted discharges to the AIWW at separate locations in the southern reach of Area 01. Additionally, Grand Strand Water and Sewer Authority's Vereen Wastewater Treatment Plant discharges to a series of Carolina Bays northwest of the AIWW. Ultimately these bays drain to the AIWW near the southern boundary of Area 01 due to fluctuating groundwater levels. These discharges are approximately seven miles from the closest viable hard clam populations.

4. Individual Sewage Treatment and Disposal Systems - Individual sewage treatment and disposal systems are being replaced by municipal wastewater collection and treatment facilities. Several projects are currently underway near Sea Mountain Highway. Interviews with SCDHEC Bureau of Environmental Sanitation personnel indicate that portions of the Little River Neck are serviced by ISTD systems; however, soils are suitable for installation and systems should operate properly as long as they are properly maintained. Additionally, a large number of residences bordering the AIWW are also serviced by these systems. Northern portions of Area 01 which are not adjacent to shellfish waters contain numerous structures which are serviced by ISTD's. These areas ultimately drain to Area 01.

5. Marinas - Numerous marinas and multiple docking facilities are located along the AIWW portion of Area 01. These facilities provide in excess of 1,250 wet slips, 550 dry slips, and 1400 lineal feet of additional anchorage space for commercial and recreational watercraft. Several of these marinas provide sewer pump out facilities and fuel for recreational and commercial vessels (Figure 3).

RECOMMENDATIONS

The shoreline survey and bacteriological data review of shellfish growing Area 01 indicated that the current classification boundary descriptions are appropriate. The following growing waters classification of Area 01 is recommended:

Prohibited: (1146.04 acres)

- 1) All waters of the Atlantic Intracoastal Waterway;
- 2) All waters of Little River;
- 3) All waters of Calabash Creek;
- 4) All waters of Milliken Cove;

- 5) All waters of Little River Inlet north of the southeastern point of Little River Neck (Tilghman Point).

Restricted: (2143.09)

- 1) All waters of the Hog Inlet estuary;
- 2) All waters of Dunn Sound;
- 3) All waters of Little River Inlet, south and east of the southeastern point of Little River Neck (Tilghman Point).

Conditionally Approved: None.

Approved: None.

Station Addition/Deactivation/Modification:

Deactivate 01-04 Mouth of Calabash Creek at AIWW

Deactivate 01-08 AIWW - Marker #116

Deactivate 01-09 AIWW - Marker #6

Stations 01-04, 01-08, and 01-09 are located within an administratively Prohibited area and will be deactivated effective June 1, 2003.

REFERENCES

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- Turner, L. E. 1989. Trend analysis of fecal coliform bacteria levels Little River/Atlantic Intracoastal Waterway 1972-1987. South Carolina Department of Health and Environmental Control. Columbia, S.C. 27 p.
- United States Department of Agriculture, Soil Conservation Service. 1986. Soil survey of Horry County, South Carolina. In cooperation with South Carolina Agricultural Experiment Station and South Carolina Land Resources Conservation Commission, National Cooperative Soil Survey, Washington, D.C. 137 p.

Table #1**Marina Facilities Within or Adjacent to Area 01**

NAME	PRIMARY USE (R)ecreational (C)ommerical	NUMBER OF SLIPS	FUEL (gal)	FUEL TYPE	PUMP OUT
Anchor Marina	R	100	12000	Gas/Diesel	Yes
Calabash Docks (NC)	R & C	750 Lineal Feet	6000	Diesel	No
Calabash Marina (NC)	R	87 Dry + 100 Lineal Ft	None	None	No
Coquina Harbor	R	520	15000	Gas/Diesel	Yes
Crickett Cove	R & C	90 Wet, 350 Dry	24000	Gas/Diesel	Yes
Dock Holidays	R & C	97	20000	Gas/Diesel	Yes
East Port	R	20 slips+200 lineal ft.	None	None	No
Harbourgate Marina	R & C	93	24000	Gas/Diesel	Yes
Little River Docks	R & C	360 Lineal Ft.+11slips	11500	Gas/Diesel	No
Mariner's Pointe	R	116	None	None	Yes
Marsh Harbour Yacht Club	R	125	20010	Gas/Diesel	Yes
North Myrtle Beach Marina	R	10 Wet, 200 Dry	2000	Gas	No

Table #2

**Shellfish Management Area 01
Water Quality Sampling Stations Description**

<u>Station</u>	<u>Description</u>	<u>Current Status</u>
01	Little River Jetty	Active
02	Mouth of Dunn Sound Creek	Active
03	AIWW - Marker #9	Inactive*
04	Mouth of Calabash Creek at AIWW	Active
05	Big bend up Dunn Sound Creek	Active
06	Bridge to Waites Island	Active
07	Hog Inlet	Active
08	AIWW - Marker #116	Active
09	AIWW - Marker #6	Active
10	AIWW at U. S. Highway 17	Inactive*
14	Palmetto Shores Marina Entrance	Inactive*
15	Ocean Drive Outfall at AIWW	Inactive*
16	50 Yards North of Ocean Drive Outfall	Inactive*
17	42nd Avenue - Cherry Grove	Active
17A	53rd Avenue Bridge on Canal	Active
18	Dunn Sound at Hog Inlet	Active
19	53rd Avenue at Main Creek	Active
(Total 17)		

Stations 3,10,14,15,16 are located in the prohibited area in area one. There are no requirements for monitoring sites in prohibited areas and thus these were deactivated in the spring of 2002. The data from these sites was not used in this update.

Figure 1.

Shellfish Management Area 01 Prior Classification

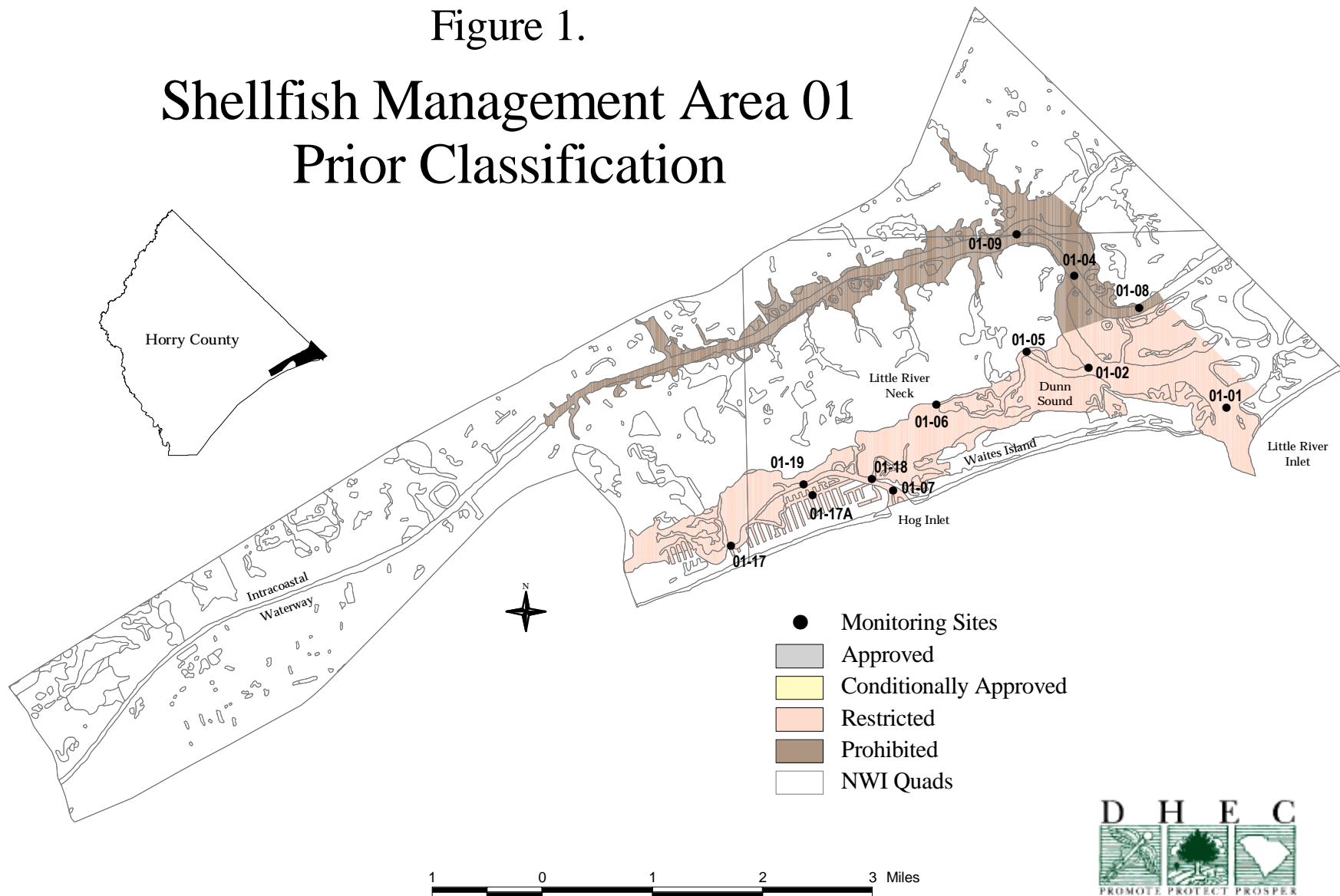


Figure 2.
Shellfish Management Area 01
Current Classification

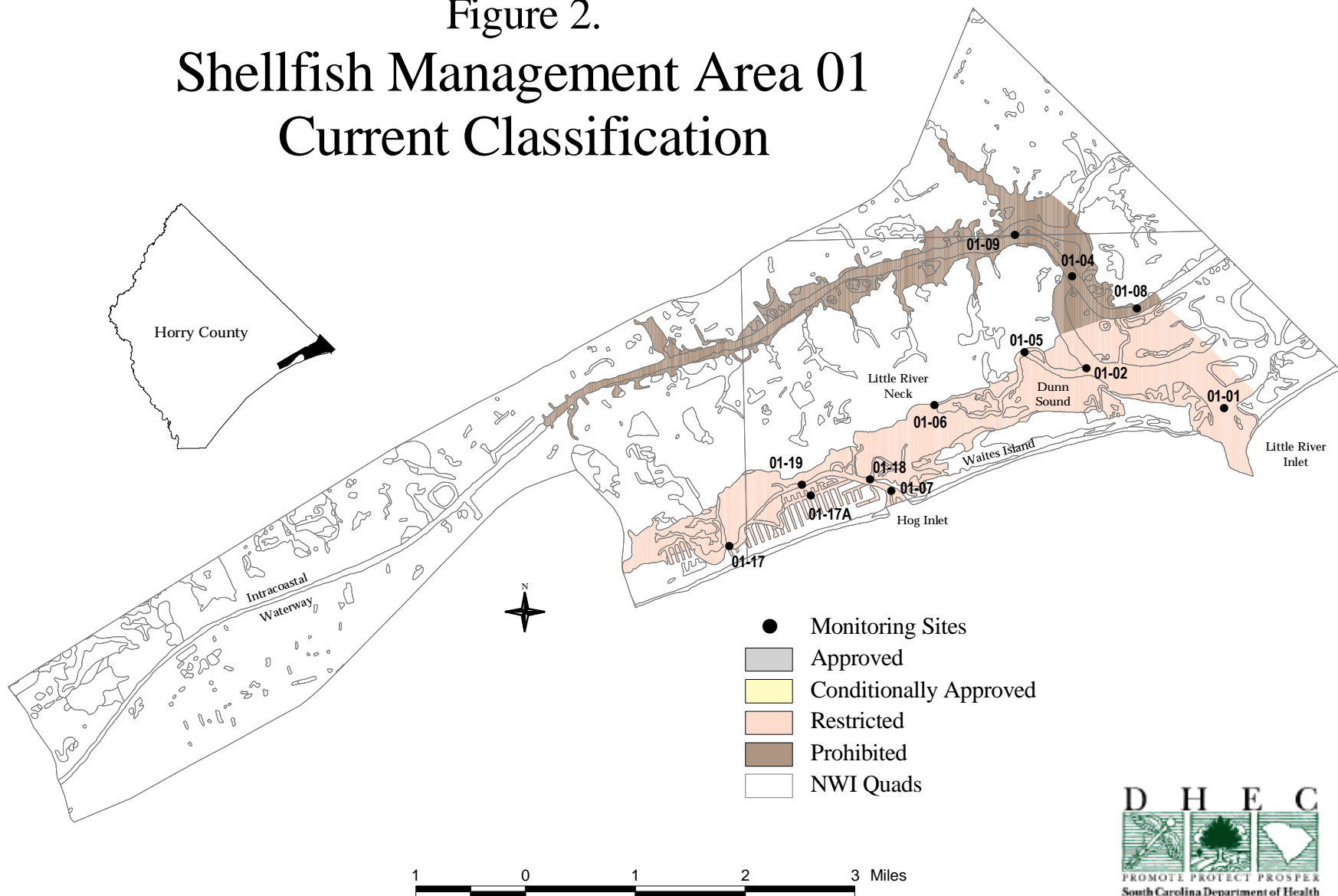


Figure 3.
Shellfish Management Area 01
Potential Pollution Sources

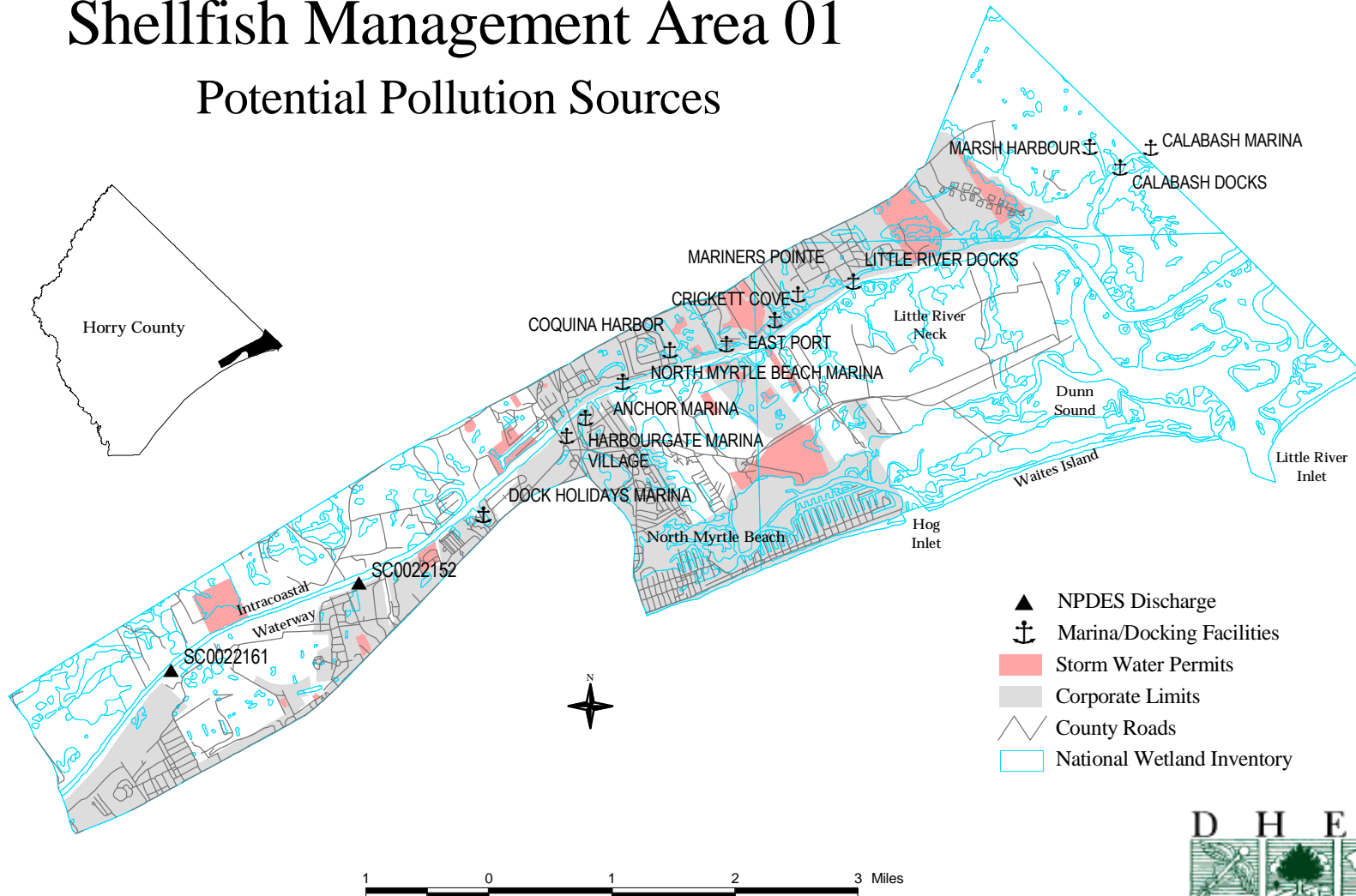


Table #3

Shellfish Management Area 01
Fecal Coliform Bacteriological Data Summary
from Shellfish Water Quality Sampling Stations between

January 01, 2000 through December 31, 2002

Station #	1	2	4	5	6	7	8	9	17
Samples	36	36	36	36	36	36	36	36	36
GeoMean	5.2	19	15.8	13.5	14.5	7.7	22	29	15.5
90th %ile	37	123	116	76	105	61	146	183	127
Water Qlty	A	R	R	R	R	R	R	R	R
Classification	R	R	P	R	R	R	P	P	R

Station #	17A	18	19						
Samples	36	36	36						
GeoMean	8.3	8.5	10.4						
90th%ile	50	65	72						
Water Qlty	R	R	R						
Classification	R	R	R						

A - Approved CA - Conditionally Approved R - Restricted
RND - Restricted/No Depuration P - Prohibited

Table #4

<p>Water Quality Sampling Stations Data</p>
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Shellfish Management Area 01

BACTERIOLOGICAL DATA

Data for each shellfish station listed in this report's "Fecal Coliform Bacteriological Data Summary Table" and in other shellfish reports, can be obtained through South Carolina's Department of Health and Environmental Control - Freedom of Information office at the address below.

Freedom of Information
2600 Bull Street
Columbia, SC 29201

Any explanation or clarity needed on the report's content can be obtained by contacting the preparer(s), and/or reviewer(s) listed on the cover page.

Table #5

<p>Rainfall Data</p>

Shellfish Management Area 01

ANNUAL TABLE OF DAILY RAINFALL DATA AND BACTERIOLOGICAL RESULTS FOR SELECTED STATIONS

SOURCE: Dept. Operated Precipitation Data Logger (Waccamaw EQC - Cherry Grove Beach)

2000	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1st	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.07	0.00	0.01
2nd	0.00	0.00	0.01	0.21	0.01	0.00	0.00	0.00	0.03	0.00	0.00	0.00
3rd	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.92	0.79	0.00	0.00	0.00
4th	0.01	0.00	0.00	0.00	0.00	0.01	0.00	1.01	0.24	0.00	0.06	0.00
5th	0.00	0.00	0.00	0.00	0.00	0.57	0.06	0.00	0.99	0.00	0.08	0.00
6th	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.39	0.03	0.00	0.01	0.00
7th	0.00	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00
8th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00
9th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.00	0.00
10th	0.59	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.01
11th	0.00	0.00	0.25	0.01	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.01
12th	0.00	0.01	0.56	0.00	0.00	0.00	0.19	0.00	0.00	0.00	0.00	0.01
13th	0.00	0.00	0.00	0.00	0.00	0.00	0.41	0.05	0.00	0.00	0.00	0.35
14th	0.00	0.54	0.00	0.12	0.00	0.00	0.00	0.01	0.00	0.00	0.14	0.00
15th	0.00	0.00	0.00	0.97	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
16th	0.00	0.00	0.41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
17th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06
18th	0.00	0.00	0.00	0.45	0.00	0.00	0.00	0.50	2.71	0.00	0.00	0.00
19th	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04
20th	0.22	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00
21st	0.00	0.00	0.01	0.00	0.00	0.00	0.13	0.00	1.53	0.00	0.00	0.06
22nd	0.00	0.00	0.00	0.00	0.00	0.00	0.16	0.00	0.61	0.00	0.00	0.00
23rd	0.00	0.00	0.00	0.00	0.00	0.50	1.28	0.10	3.11	0.00	0.00	0.00
24th	0.00	0.01	0.00	0.08	0.00	0.00	0.78	0.00	0.00	0.00	0.00	0.00
25th	0.00	0.00	0.00	0.09	0.38	0.00	0.95	0.70	0.03	0.00	0.82	0.00
26th	0.00	0.00	0.00	0.01	0.19	0.00	0.20	0.01	0.00	0.00	0.01	0.00
27th	0.00	0.04	0.01	0.00	0.00	0.00	0.01	0.14	0.00	0.00	0.00	0.18
28th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.14
29th	0.00	0.00	0.00	0.00	0.00	0.88	0.30	1.03	0.00	0.00	0.00	0.00
30th	0.00		0.00	0.00	0.00	0.00	0.45	0.90	0.00	0.00	0.00	0.00
31st	0.00		0.00		0.00		0.29	0.00		0.00		0.00

(Monthly Figures)

Year's Rainfall Total: **30.68**

SUM	0.83	0.60	1.26	1.94	0.59	1.99	5.27	6.06	10.07	0.08	1.12	0.87
MAX	0.59	0.54	0.56	0.97	0.38	0.88	1.28	1.03	3.11	0.07	0.82	0.35
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG	0.03	0.02	0.04	0.06	0.02	0.07	0.17	0.20	0.34	0.00	0.04	0.03

(Stations)	Selected Sample Stations Bacteria Results on Date Sampled Above for Hog Inlet/Cherry Grove											
01-07	2	5	5	1.9	8	33	170	2	110	4	5	17
01-17	13	9	23	12	33	33	920	79	540	5	4	2
01-17A	22	7	4	2	17	49	70	2	49	17	1.9	5
01-18	8	1.9	7	8	17	49	95	1.9	70	23	2	5
01-19	13	5	5	2	22	13	350	5	49	14	2	5

ND = No Data

Shaded entries indicate day sample taken

(Shellfish Mgmt Area 01)

ANNUAL TABLE OF DAILY RAINFALL DATA AND BACTERIOLOGICAL RESULTS FOR SELECTED STATIONS

SOURCE: Dept. Operated Precipitation Data Logger (Waccamaw EQC - Cherry Grove Beach)

2001	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1st	0.00	0.01	0.00	0.03	0.00	0.04	0.00	0.00	0.00	0.00	0.03	0.00
2nd	0.05	0.03	0.00	0.00	0.00	0.01	3.31	0.00	0.00	0.00	0.11	0.00
3rd	0.00	0.00	1.27	0.03	0.00	0.11	0.55	0.00	1.64	0.00	0.00	0.00
4th	0.00	0.63	0.43	0.00	0.00	0.01	0.01	0.00	0.21	0.00	0.00	0.00
5th	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.01	0.10	0.00	0.00
6th	0.00	0.01	0.00	0.00	0.00	0.00	2.38	0.00	0.00	0.03	0.00	0.00
7th	0.00	0.00	0.00	0.00	0.00	0.14	0.01	0.00	0.00	0.03	0.00	0.00
8th	0.24	0.00	0.10	0.00	0.00	0.75	0.03	0.06	0.00	0.00	0.00	0.00
9th	0.00	0.06	0.02	0.00	0.11	0.04	0.02	0.00	0.08	0.00	0.00	0.00
10th	0.00	0.06	0.01	0.00	0.00	0.01	0.00	0.00	0.12	0.00	0.00	1.57
11th	0.00	0.00	0.00	0.00	0.00	0.00	1.17	0.00	0.37	0.00	0.00	0.55
12th	0.55	1.68	0.70	0.00	0.00	0.00	0.51	0.00	0.01	0.00	0.00	0.00
13th	0.00	0.00	0.25	0.00	0.00	0.47	0.81	0.00	0.08	0.00	0.00	0.01
14th	0.17	0.00	0.00	0.00	0.00	0.51	0.00	0.23	0.03	0.14	0.00	0.11
15th	0.00	0.00	1.15	0.00	0.00	0.06	0.00	0.70	0.00	0.01	0.00	0.00
16th	0.01	0.00	0.00	0.00	0.00	0.19	0.00	0.00	0.00	0.00	0.00	0.00
17th	0.06	0.02	0.01	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
18th	0.00	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13
19th	0.00	0.00	0.00	0.10	0.00	0.00	0.95	0.00	0.00	0.00	0.00	0.00
20th	0.10	0.00	2.81	0.00	0.00	0.00	0.10	0.03	0.00	0.00	0.02	0.00
21st	0.00	0.00	0.08	0.00	0.03	0.00	0.00	0.00	0.16	0.00	0.00	0.00
22nd	0.00	0.32	0.00	0.00	0.00	0.07	0.00	0.01	0.01	0.00	0.00	0.00
23rd	0.00	0.00	0.00	0.00	0.22	0.00	0.62	0.00	0.00	0.00	0.10	0.04
24th	0.00	0.00	0.00	0.00	0.00	0.01	0.05	0.00	0.07	0.00	0.78	0.00
25th	0.00	0.01	0.15	1.14	0.00	0.01	0.00	0.03	0.07	0.00	0.26	0.00
26th	0.00	0.01	0.01	0.00	0.02	0.00	0.06	0.00	0.00	0.00	0.01	0.00
27th	0.00	0.00	0.07	0.00	0.00	0.00	0.54	0.00	0.00	0.00	0.00	0.00
28th	0.00	0.25	0.00	0.00	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00
29th	0.06		1.08	0.00	2.20	0.00	0.20	0.00	0.00	0.00	0.12	0.00
30th	0.07		0.00	0.00	0.00	0.00	0.00	1.33	0.00	0.00	0.00	0.00
31st	0.00		0.00		1.17	0.00	0.00	0.82		0.00		0.00

(Monthly Figures)

Year's Rainfall Total: 41.76

SUM	1.31	3.09	8.20	1.31	3.84	2.43	11.36	3.21	2.86	0.31	1.43	2.41
MAX	0.55	1.68	2.81	1.14	2.20	0.75	3.31	1.33	1.64	0.14	0.78	1.57
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG	0.04	0.11	0.26	0.04	0.12	0.08	0.37	0.10	0.10	0.01	0.05	0.08

(Stations)	Selected Sample Stations Bacteria Results on Date Sampled Above for Hog Inlet/Cherry Grove											
01-07	1.9	2	170	1.9	5	13	1.9	1.9	5	11	2	17
01-17	1.9	1.9	46	1.9	2	49	17	7	170	7	5	49
01-17A	2	1.9	95	1.9	1.9	21	13	1.9	11	17	2	23
01-18	1.9	1.9	64	1.9	4	70	5	1.9	5	7	7	140
01-19	1.9	1.9	110	1.9	2	49	17	1.9	5	22	2	22

ND = No Data

Shaded entries indicate day sample taken

(Shellfish Mgmt Area 01)

ANNUAL TABLE OF DAILY RAINFALL DATA AND BACTERIOLOGICAL RESULTS FOR SELECTED STATIONS

SOURCE: Dept. Operated Precipitation Data Logger (Waccamaw EQC - Cherry Grove Beach)

2002	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1st	0.00	0.01	0.10	0.01	0.01	0.00	0.00	0.00	0.05	0.00	0.00	0.00
2nd	0.50	0.00	1.37	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00
3rd	0.19	0.00	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4th	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.19	0.00	0.00	0.03	0.00
5th	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.27	0.17
6th	0.84	0.32	0.00	0.00	0.00	0.00	0.25	0.06	0.00	0.00	0.76	0.00
7th	0.00	1.50	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00
8th	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.92	0.00	0.00	0.00
9th	0.00	0.00	0.11	0.00	0.40	0.00	0.12	0.00	0.00	0.00	0.00	0.00
10th	0.00	0.21	0.00	0.05	0.60	0.00	0.00	0.00	0.08	0.02	0.04	0.62
11th	0.00	0.00	0.00	0.12	0.00	0.00	0.38	0.00	0.00	1.28	0.36	0.05
12th	0.13	0.00	0.06	0.08	0.47	0.00	0.00	0.00	0.00	0.01	0.76	0.00
13th	0.13	0.00	0.85	0.00	0.01	0.00	0.20	0.00	0.00	0.00	0.37	0.74
14th	0.49	0.00	0.00	0.00	0.00	0.09	0.53	0.00	0.02	0.00	0.00	0.00
15th	0.00	0.18	0.00	0.00	0.00	0.01	0.00	0.07	0.12	0.98	0.01	0.00
16th	0.01	0.01	0.01	0.00	0.00	0.00	0.00	0.01	0.31	0.00	0.53	0.00
17th	0.00	0.00	0.00	0.00	0.48	0.00	0.00	0.01	0.00	0.00	0.26	0.00
18th	0.00	0.00	0.00	0.00	0.04	0.14	0.00	0.00	3.02	0.00	0.00	0.00
19th	0.04	0.00	0.00	0.00	0.00	1.26	0.00	0.00	0.00	0.00	0.00	0.02
20th	0.05	0.00	0.00	0.00	0.00	0.45	0.78	0.00	0.00	0.00	0.00	0.12
21st	0.03	0.05	0.09	0.00	0.00	0.11	0.08	0.00	0.00	0.01	0.00	0.00
22nd	0.01	0.00	0.00	0.00	0.00	1.43	0.00	0.00	0.00	0.37	0.00	0.00
23rd	0.03	0.00	0.00	0.00	0.00	0.09	0.66	0.00	0.36	0.00	0.00	0.00
24th	0.01	0.00	0.00	0.00	0.00	0.00	0.67	0.32	0.01	0.31	0.00	1.09
25th	0.11	0.00	0.00	0.84	0.00	0.00	0.54	0.11	0.28	0.00	0.00	0.01
26th	0.00	0.00	0.07	0.00	0.00	0.00	0.25	0.00	0.62	0.00	0.00	0.00
27th	0.00	0.00	0.02	0.00	0.00	0.07	0.01	0.55	0.01	0.00	0.00	0.00
28th	0.00	0.00	0.00	0.00	0.01	0.00	0.00	2.56	0.00	0.00	0.00	0.00
29th	0.00		0.00	0.00	0.07	0.00	0.00	2.28	0.00	0.00	0.00	0.00
30th	0.00		0.00	0.00	0.00	0.00	0.00	1.83	0.00	0.00	0.00	0.00
31st	0.01		0.29				0.52	0.05		0.01		0.01

(Monthly Figures)

Year's Rainfall Total: **45.03**

SUM	2.75	2.28	3.08	1.10	2.09	3.68	4.99	8.04	7.81	2.99	3.39	2.83
MAX	0.84	1.50	1.37	0.84	0.60	1.43	0.78	2.56	3.02	1.28	0.76	1.09
MIN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
AVG	0.09	0.08	0.10	0.04	0.07	0.12	0.16	0.26	0.26	0.10	0.11	0.09

(Stations)	Selected Sample Stations Bacteria Results on Date Sampled Above for Hog Inlet/Cherry Grove											
01-07	2	5	1.9	1.9	11	1.9	79	1.9	70	540	49	2
01-17	2	13	23	23	33	1.9	11	13	130	23	170	1.9
01-17A	11	2	2	5	8	1.9	17	1.9	110	64	110	1.9
01-18	5	1.9	1.9	1.9	2	1.9	70	1.9	46	240	110	2
01-19	23	7	1.9	64	7	1.9	11	17	64	220	110	1.9

ND = No Data

Shaded entries indicate day sample taken

(Shellfish Mgmt Area 01)